

Intellectual aspects of the problem apart, the material difficulties of underwater excavation make it impossible for a landsman to direct fully efficient research unless he uses divers who are not only professional but also have experience of the sites and wreck formations."

Honor Frost, with whom we recently met in London, is both an archaeologist and underwater diver who spent many years in the Mediterranean. She is one of nautical archaeology's earliest pioneers and has kindly shared with us her thoughts on the harbours of the Lebanese coast. Being a somewhat recent discipline, Nautical Archaeology aims to study maritime aspects of past civilisations whose remains are deep underwater or simply awash. In the past, archaeologists who could not dive were easily deceived either by second hand reports or by appearances seen from the surface of the water neither of which could be verified.

"If only the diver understood, if only the archaeologist could."

Although Frost's work led her all over the Mediterranean basin, she spent ten years (1957-1967) working in the Lebanon: *"I always commuted from London to Lebanon in my Volkswagen beetle."* Her research included Phoenicia in the Late Bronze Age through the Roman period and focused on three particular fields:

- The study of anchors under the sea and on land
- The Syrian-Lebanese coast and its Phoenician harbours, namely Sidon, Tyre and Byblos
- The exploration of shipwrecks which led to the discovery and reconstruction of the Punic longship at Lylibaeum (Marsala) in Sicily.

Frost considers herself lucky to have been in France on the Mediterranean where timely events led to her introduction to underwater diving.

"I first used a bottle in the South of France, where I had been sent to convalescence, at a time when the post-war British travel allowance was at its lowest ebb. I was living with friends but, even so, had very little money to spend on expensive sports. I used to watch a man at the local beach giving swimming lessons and occasionally teaching the use of an aqualung. One day as I swam nearby and he was giving a lesson he shouted: There's nothing I can teach you! Oh yes there is! You could teach me how to dive!"

Her instructor Georges Barnier turned out to be a member of the Club Alpin Sous-Marin de Cannes. Frost's earliest dives were in the South of France on a large Roman ship lying at the foot of a rock, called the *Balise de la Chrétienne*. The concession, or permission to dig, had been given to the Cannes Diving Club. It became known as the "*Chrétienne A*," being the first of three wrecks discovered around the base of the safety beacon off Anthéor, France.

... "Relative to marine research as a whole, wreck excavation is not of first importance, but I started my diving life on a wreck

and the subject has never ceased to fascinate me... Getting back to a wreck to see whether even the sand layers could be recorded became an obsession..."

After deep diving off the French shores, circumstances threw her into the shallow waters of the Eastern Mediterranean's ancient harbours, where she learned that there was more to submarine archaeology than sunken ships. In 1957 Frost reported for work at Jericho in Palestine, on an excavation led by Miss Kathleen Kenyon, thus bringing her back to the Levant.

Anchors

Frost's first exposure to the "composite" anchor (with supplementary holes through the base to hold sticks that grip into the sand) came when she found one in the bay at Tabarja (coastal site North of modern-day Jounieh). A Lebanese sponge diver, Edouard Chébabé, explained to her how a rope is passed through a hole cut across one corner. A stone weighing around 20 kgs is sufficient to engage this type of anchor and hold a boat about 6 metres long. These anchors are cheap and simple to make. Another anchor weighing over half a ton was also found wedged between rocks at the bottom of the bay at Tabarja. Along with the anchor, columns made of a hard black stone were strewn at the bottom of the bay and traces of occupation dating from the early Bronze Age to Roman times were sited nearby. Tabarja has never been excavated but it is likely that there was a settlement there close to the nearby Temple of the Obelisks. The Tabarja anchor is the only specimen of this size found off the Lebanon coast. Judging by its shape it might have been dropped by an Ugaritic ship.

Harbours

The first harbours on the exposed Levant coast line relied on reefs to provide natural shelter. The principal harbours in the North are Tripoli, Einfe and Batroun; In the south was Tyre, which was a large reef island and Sidon, which had a closed land based harbour as well as an offshore anchorage used mostly for foreign ships. Harbours such as these existed before man had learned to build jetties. These Levantine "proto-harbours" of the Phoenician homeland were never satisfactorily dated as archaeologists lacked reliable criteria in establishing their chronology. All early ports had one thing in common: they had to be kept clear of silt at a time when dredging was unknown. This was overcome by three main methods:

- Designing the outer parts so that they deflected silt-bearing currents.
- By careful adaptation of depth in relation to the layout of the docks on the overall plan.
- By allowing a controlled current to sweep through the port or by flushing it out when necessary by means of channels.



Beirut, harbour



Byblos, harbour

Tyre

A study of Tyre's harbour, *Tyr, un grand port disparu* was first published by the late R.P. André Poidebard in 1939 followed in 1951 by *Sidon. Aménagements antiques du port de Saida*, which he published with the assistance of Jean Lauffray. The port of Sidon, silted up for years, gradually became inaccessible to the flotilla of coastal ships and fishing vessels of the area. A new jetty constructed in 1935 did not last. In order to resolve the problem the *Régie Générale des Chemins de Fer et Travaux Publiques* in charge of the dredging of the port of Sidon on behalf of the Lebanese government decided to investigate ancient methods of harbour planning. Following Poidebard's pioneering studies new evidence has emerged which alters some of his theories; e.g. the "moles" (jetties) south of Tyre have, on closer inspection, proved to be natural phenomena.

When the city of Tyre was on an island, the basic design of its outer port installations (which were for foreign shipping) depended on the line of reefs running parallel to the shore and tangential to its seaward tip. In some places these reefs now emerge as islands, in others they are now submerged, but the breaks between them coupled with the formation of the sea bed which sloped to the South, prevented silting. These natural features could be adapted and improved so there was no need for special flushing channels. It was Alexander's causeway which turned the island of Tyre into a peninsula, thus upsetting the equilibrium by diverting the flow of currents in the inner harbour.

"Today Tyre's port poses very difficult technical problems. It is the most complex of Phoenician ports..."

Frost continued diving throughout 1966 and 1967 along the northern reef of Tyre, but her mission stopped before the questions she had formulated could be put to the test.

When the Tyre project had to be canceled at 24 hours notice by Emir Maurice Chéhab, I switched the expedition to Malta but still had this nostalgia for Lebanon. Afterwards remembering that the first colony of Tyre was Motya in nearby Sicily, I went over to visit it."

This led Honor Frost to the discovery, in 1971, of the Marsala Punic oared longship of the 3rd century B.C. This part of Sicily being opposite the Egadi Islands where the last battle of the First Punic War was fought, potsherds and fragments of ancient ships suggest that some of the fleet sank there.

"I was commissioned by the Sicilian Department of Antiquities to do a survey and I found this unique wreck. It remains the only known longship (or warship) of Classical Antiquity."

Sidon

Knowing that a new harbour building project had been mooted in Sidon, Maurice Chéhab, then Director of

Antiquities, commissioned Frost in 1966 to survey the offshore island at Sidon so that no submerged antiquities would be destroyed.

"...Sidon and Tyre were not the first ports I saw through a mask, but they were the first to interest me..."

Although the island anchorage appears in Poidebard and Lauffray's publication, they did not have a diver at their disposal beyond the confines of the inner harbour. The new expedition lasted 16 days and consisted of only one diver/archaeologist, Honor Frost, one swimmer Jules Chaumény and Elisabeth Dupuytison-Lagarce, an archaeologist and "excellent swimmer." The rock island, some 540 m long, is shaped like a boomerang, lies parallel at a distance of 1km opposite Sidon's ancient rock-cut harbour on the mainland. An islet at the southernmost tip was part of the island before wave erosion broke it off.

The earliest harbour-builders, restricted by the shape of the reefs available to them, sited their quays and warehouses accordingly. One rock-cut chamber called by Renan the *bain des femmes* was cut towards the south of Sidon Island; it communicated with the main quay through a door cut in its landward wall. In Renan's time this chamber was used by the ladies of the town who bathed there, taking advantage of the privacy it offered and the fact that it contained clear shallow water. Paving stones (now surmounted by a "wave-notch") do, however, indicate that the original function of the chamber had been a *rystorehouse* for goods deposited in this outer harbour before being transferred to the mainland. On the landward side of the Island Frost described a further indication of a sea-level change: two lines of rock-cut *mooring-bits* at water's edge; one of them is still servicable, but the other is now submerged.

In 1973 Honor Frost noted in the *International Journal of Nautical Archaeology* that extensive remains were submerged around Sidon Island. To landward, along its south east end, lay many heavy blocks of masonry while, further north, she found piles of wall-facing plates which represented discarded quartzite revetment (similar revetment made from this imported stone was found on the Persian period fortifications at Byblos). Being relatively light, they had been redistributed in piles by the strong north-flowing current that runs along this sector. Both types of architectural remains show that successive harbour-installations were taken for use as quarry-stone during various later periods. In the course of these removals many stones fell into the sea. It has been estimated that some 12,000 cubic tons of masonry including carved stones and columns landed in the deeper water to the South, where the main Island is now separated by a shallow neck of rock from an islet which must once have been attached to it. These remains which include large mortised and notched blocks, columns and

column-bases of various sizes and fragments of carved lintels, are in addition to the aforementioned quartzite revetment which lies further to the north.

On the shallow neck of rock lay sundry paving stones, while a cross-shaped cutting on the islet suggested that there had once been a quay there. Another rock cut quay that had been paved with blocks was noted further north, but it was not fully investigated because Honor Frost's survey was confined to the *underwater remains and their relation to the shore*. In this connection, two jetties on the landward side of the Island were investigated: one of them is still submerged, but the other has been stripped, so that only the blocks of its foundation-course survive underwater.

In 1972, the seminal work of the geographers P. Sanlaville and M. Fevret suggested new methods of dating the complex and often localised sea-level changes which were subsequently used in dating ancient harbours between *Maameltein* and *Nahr Ibrahim*. Their paper dealt only with these few kilometres of the Lebanese coast where there appeared to have been a localised drop in the sea-level relative to the land. Dating of sea-levels can also be obtained by the analysis of the remains of dead *Vermetidae* (molluscs that only live at only mean sea level) by Carbon 14. Three sea levels were thus established:

- The Flandrian sea level (pre-Bronze Age) which appears as a cliff with abrasion marks submerged at a depth of 2 to 3 metres along most parts of the coast line.
- The Zennadian sea level (2000-1118 B.C. give or take 80 yrs) represents the time by which the sea had retreated to such an extent that the molluscs could no longer survive. The difference between the pre-Bronze

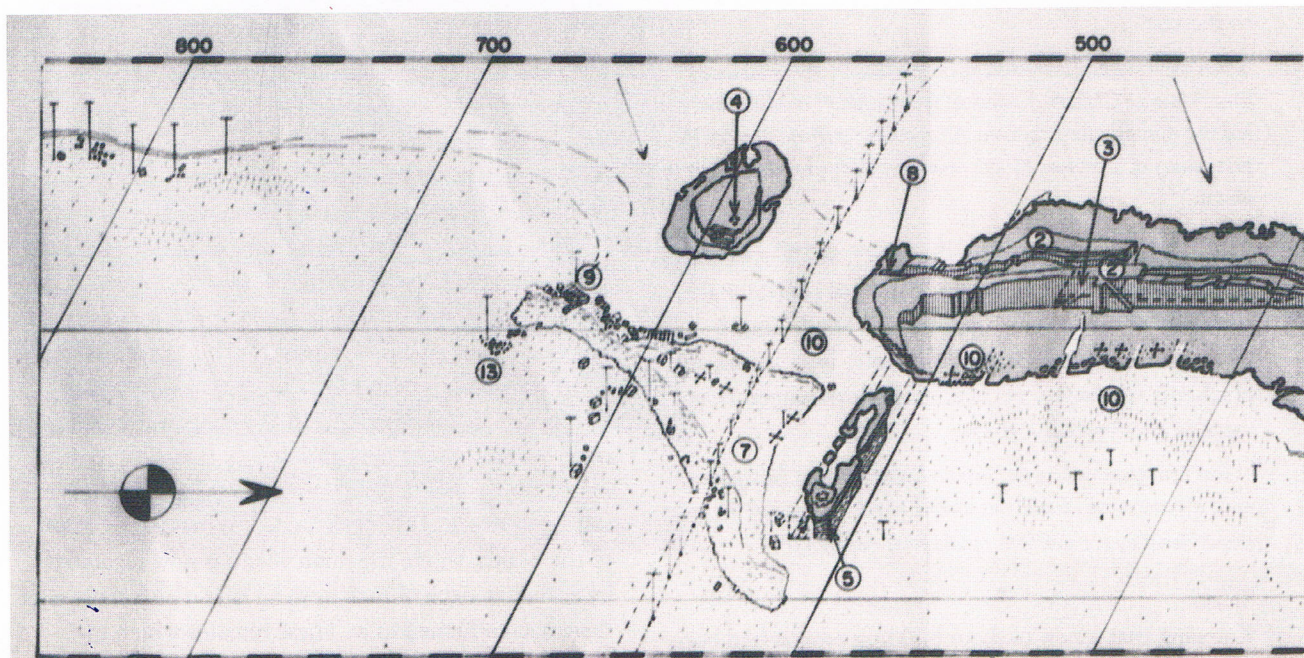
Age Flandrian and the Middle to Late Bronze Age Zennadian levels totals some 4 to 5 m.

- The Tabarjian sea level (2nd century B.C. to the end of the 2nd century A.D. or early in 3rd century A.D.) identified by a combination of evidence: the lines of dead molluscs, by wave-notches and by wide erosion shelves or *trottoirs*. When a line of *Vermetidae* runs along the base of a wall, that wall must certainly have been built.

At Sidon, Sanlaville pointed out that an erosion notch 1 metre above the present level runs along inside the rock, under a series of mooring bitts. According to Honor Frost this same line can be seen in the *bain des femmes*. These marks represent the Tabarja line, which indicates a sea level 1 metre higher than the present one, which lasted over a period of some 400 years ending at the turn of the 2nd century A.D. As to the quays, columns, and fragments of carved lintels etc, which Frost believes belong to the Persian period, these continued to be used up to and during the Byzantine period. The Crusaders may have used some columns from the islands in the construction of the *Château de la Mer* in front of the city of Sidon, but it would seem to have been against their interest to dismantle the quays and jetties. Emir Fakhr El Din (1572-1635) ordered the final destruction of the installations and sank blocks to close the inner harbour in order to prevent the Turks from using it.

Regarding the remaining harbours in Byblos, Tripoli, Batroun, and Beirut:

"I do not believe that the present fishing harbour was the ancient port of Byblos. Large ships could not get into such a small harbour especially if they were carrying logs of 23 meters long like the largest plank on the Cheops ship (3rd millenium). I suspect



Sidon island

it lies to the south of Byblos, possibly under Maurice Dunand's dumps where the river comes out into a now silted bay. There is another possibility to the north shown by recent trottoir formations. The little modern harbour is a natural "solution-basin" which has formed in the soft, limestone rock. It could not take big, timber-carrying vessels."

"... Landscape archaeology is needed at Byblos. Although I would rather work on a wreck, I recognise that it is the most useful method of approach to the long standing problem at Byblos..."

"Although I never investigated Tripoli, its numerous reefs and rock cuttings ought to be very promising; like Batroun it has never been properly studied. The Tabarja line can be seen inside the rock-cut sea defences at Batroun thus proving they pre-date the Crusaders to which they are usually attributed. As for Beirut a series of investigations could determine the original coast-line. For the Lebanon, I reiterate that... The interdisciplinary approach is required... It is not so much what has happened under the sea that matters as what has happened on the shore."

Selected works by Honor Frost

Under the Mediterranean (London, 1963).

"The Stone Anchors of Byblos," *Mélanges de l'Université Saint-Joseph* LXV (1969).

"Recent Observations on the Submerged Harbourworks at Tyre," *Bulletin du Musée de Beyrouth* XXIV (1971).

"The Offshore Island Harbour at Sidon and Other Phoenician Sites in the Light of New Dating Evidence," *The International Journal of Nautical Archaeology and Underwater Exploration* 21, (1973).

"The Punic Ship: Final Excavation Report," [et al] *Supplemento: Notizie degli Scavi di Antichità, Serie Ottava* XXX (1976).

"The Kition Anchors," Appendix I, *Excavations at Kition* V, I (Nicosie, 1985).

"Anchors Sacred and Profane, The Ugarit-Ras Shamra Stone Anchors Revised and Compared," *Ras Shamra-Ougarit, VI: arts et industries de la pierre* (Paris, 1991).

Sidon island illustration below:

1.

Piles of rubble, largely quartzite revetment plaques from dismantled quays and other installations.

2.

Rock-cut sea walls: hatching.

3.

'Bain des femmes': the paved rock-cut chamber.

4.

Rock-cut emplacement for winch.

5.

The southern jetty with portions still above water.

6.

Foundations of northern jetty: note two cuboid blocks remaining from its upper course.

7.

10,200m³ of masonry washed down from between the Islet and the Island.

8.

Eroded trace of the rock-cut wall that once joined the Islet to the Island.

9.

Alignment of 3m blocks at the edge of the rock-shelf between the Islet and the Island.

10.

Paving stones.

11.

Mooring bitts: upper level.

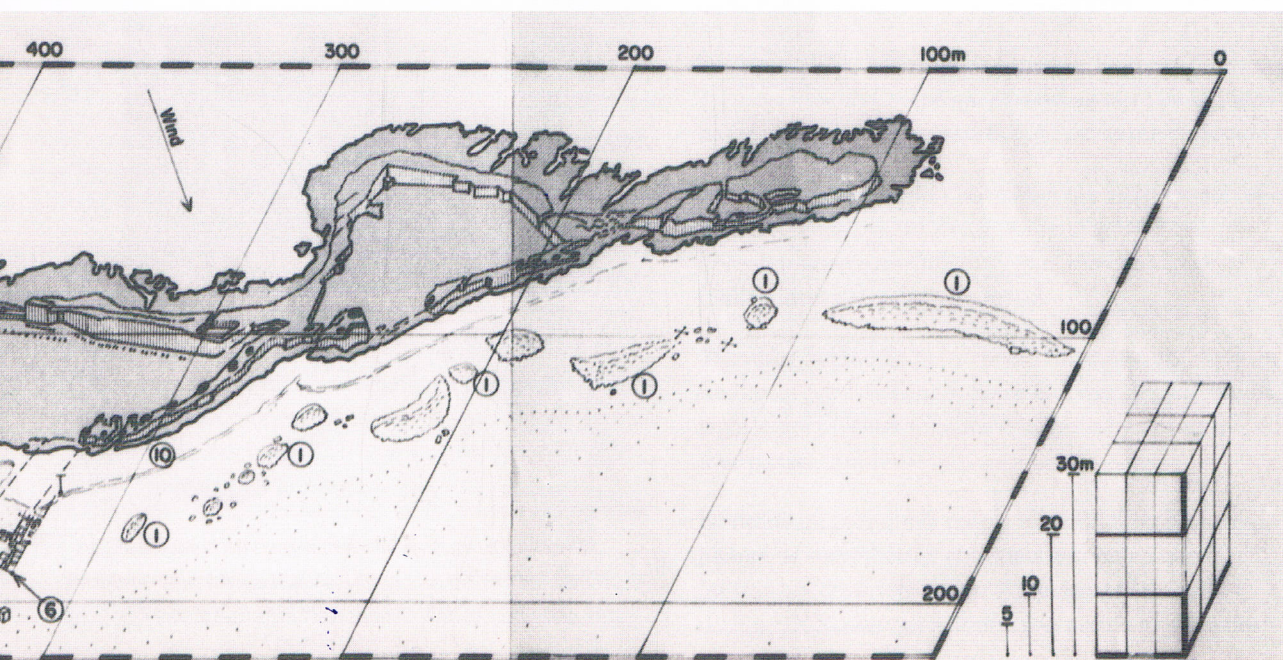
12.

Mooring bitts: lower level.

13.

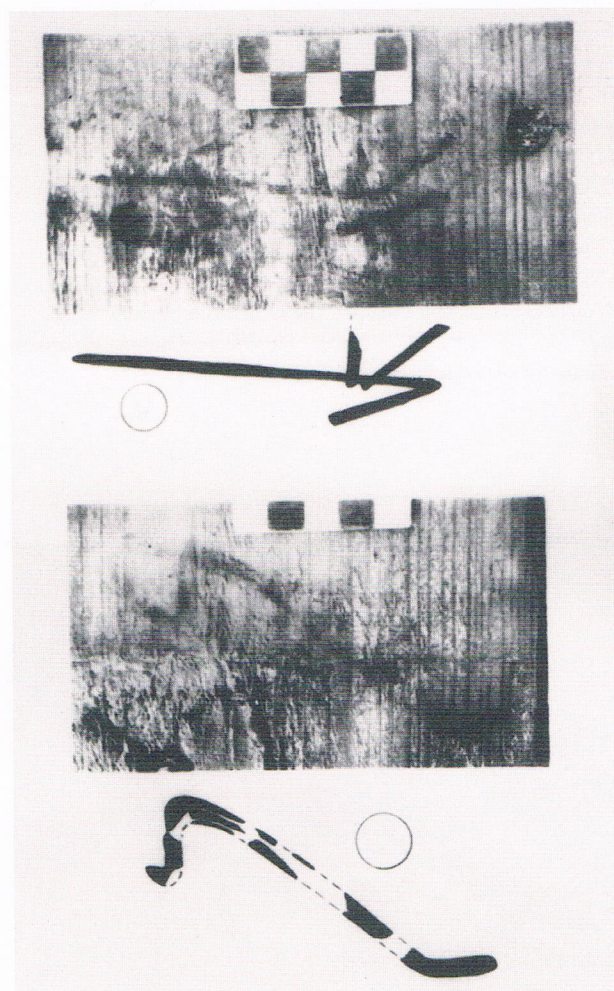
Column base and dove tailed blocks.

[Honor Frost, "The Offshore Island Harbour at Sidon and Other Phoenician sites in the Light of New Dating Evidence," *The International Journal of Nautical Archaeology* (1973)].





Discovery of the Marsala wreck



The complete repertoire of inscriptions on the Punic wreck include forty alphabetical letters the size of about one centimetre and inscribed with a quill pen and black ink, as well as two Phoenicio-Punic words.

A merchant vessel and a Trireme in the Beirut National Museum (quoted from [Lucien Basch, *Le musée imaginaire de la marine antique* (Athènes, 1987)])

In the Beirut National Museum a sarcophagus of the 2nd century B.C. discovered and documented by G. Contenau in 1921 bears, on one of its shorter sides, an illustration of a merchant ship. The term "merchant" is ambiguously used to describe a wide spectrum of ancient vessels including large transport ships, shore-skirting boats as well as local fishing boats.

The structure of these ships, henceforth commonly known as "merchant" for lack of a better description, did not follow any set unifying criteria. Instead, individuals adapted their vessels to operate as efficiently as possible in varying conditions of time and space as well as using local design traditions. Such illustrations as seen on the sarcophagus therefore really ought to be viewed as individual portraits. Although the hull on this illustration seems to protrude beyond the usual proportions it remains nevertheless a plausible rendering of a ship's hull from that epoch. In comparison, the illustrated rigging seems rather clumsily done.

Another oddity of the Sidon vessel is the metal sheath ('unferro') covering the protruding stem of the keel for what seems to be purely aesthetic purposes. The stern is arched like a swan's neck and topped by a small mast with a narrow diameter. For a comprehensive description of the Sidon ship.

It is possible that Greek triremes were, like their Phoenician counterparts, built around the 7th century B.C. However, the Phoenician boats enjoyed large-scale usage which made the two incomparable in terms of development. Byblian engravers made of their triremes heraldic emblems ignoring the true proportions of various parts of the vessel, always illustrated from the port side and, as at Arados, with an absence of oars. Thus the smaller shields and the larger figure-heads of horses or roaring lions. The battle-deck is surmounted by three busts of helmeted warriors carrying shields (approximately 4th century B.C.). For further information on Byblian triremes and others in Phoenicia.



Phoenician round ship on a sarcophagus 2nd Century A.D.
Sidon, Beirut National Museum



Phoenician long ship on a coin, Byblos,
Beirut National Museum.